

Image Acquisition- Sensors: MRI

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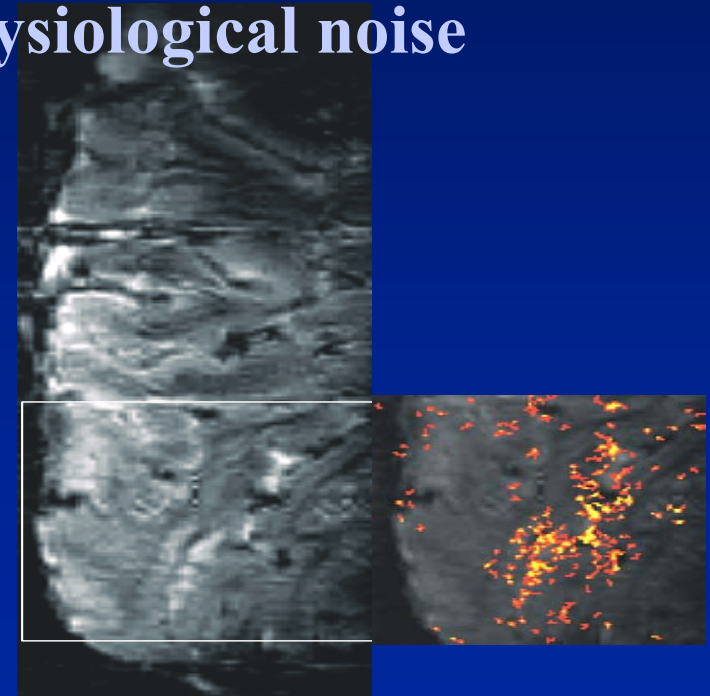
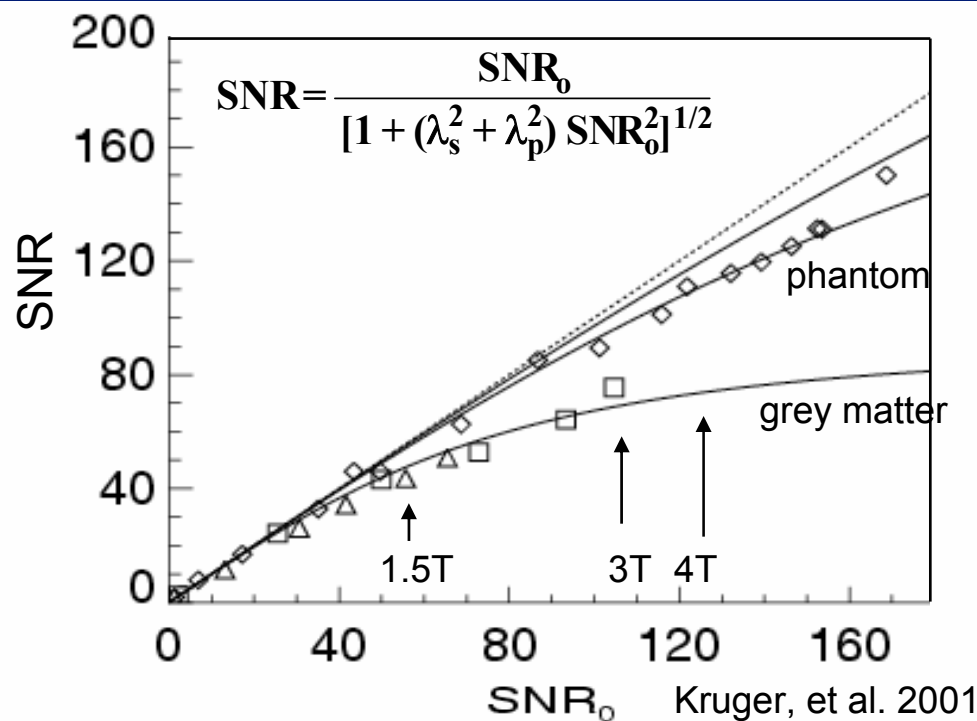
- Higher field
- Increased acquisition capabilities
- Hybrid imaging



* National Center for
Research Resources

Increased B_0 ($> 4T$)

- Increased SNR/resolution, T_1 , chem. shift
- Decreased T_2 , T_2^*
- Increased SAR, acoustic noise, physiological noise

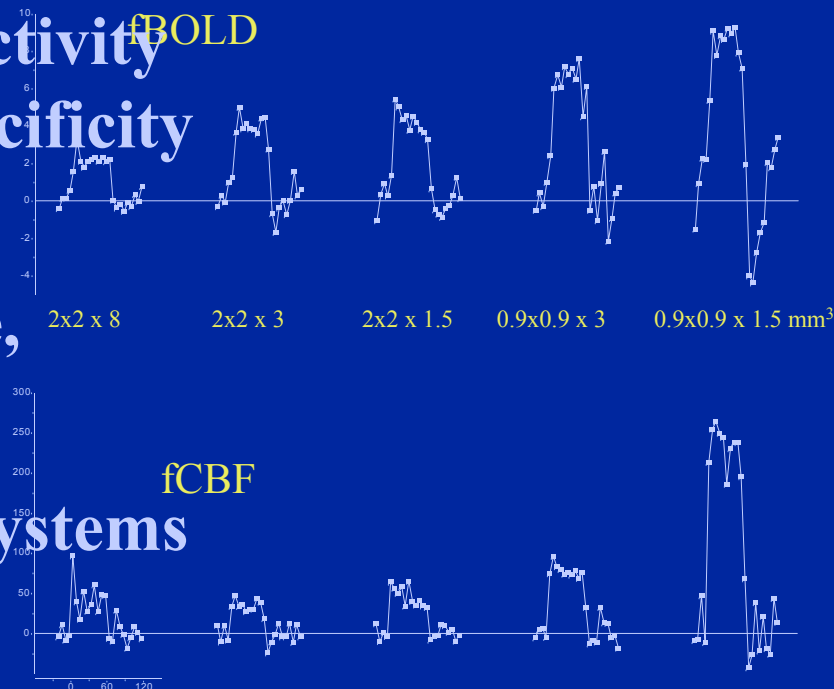


500 μ , 7T
Josef Pfeuffer, et al

Increased Bo

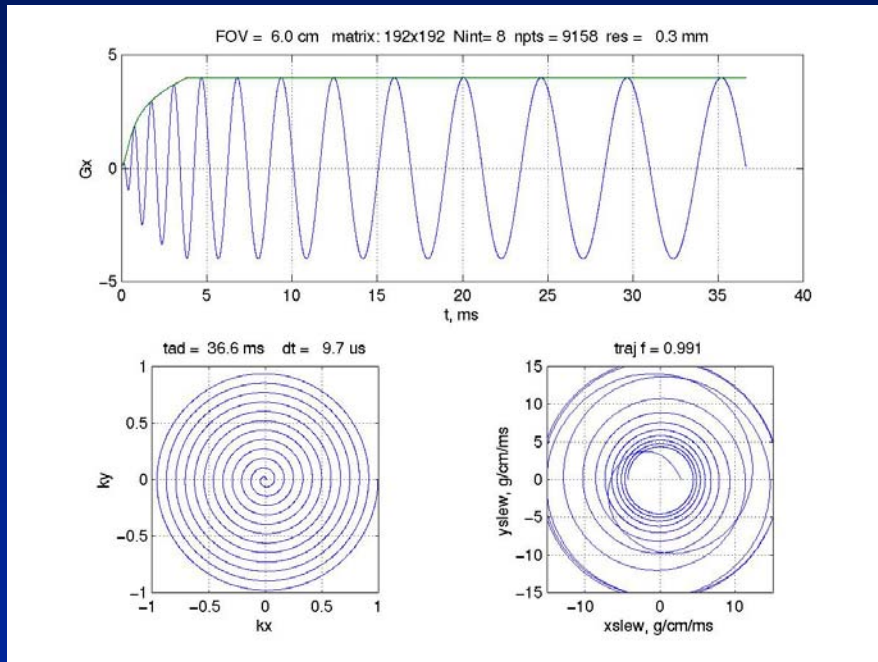
Facilitates study of:

- brain biophysics/biochemistry
e.g., metabolic cycles, perfusion,
neuronal architecture/connectivity
provides increased tissue specificity
- novel contrast mechanisms
e.g. multiquantum coherence,
susceptibility, currents?
- MRS/MRI of other organ systems
e.g. breast, musculoskeletal

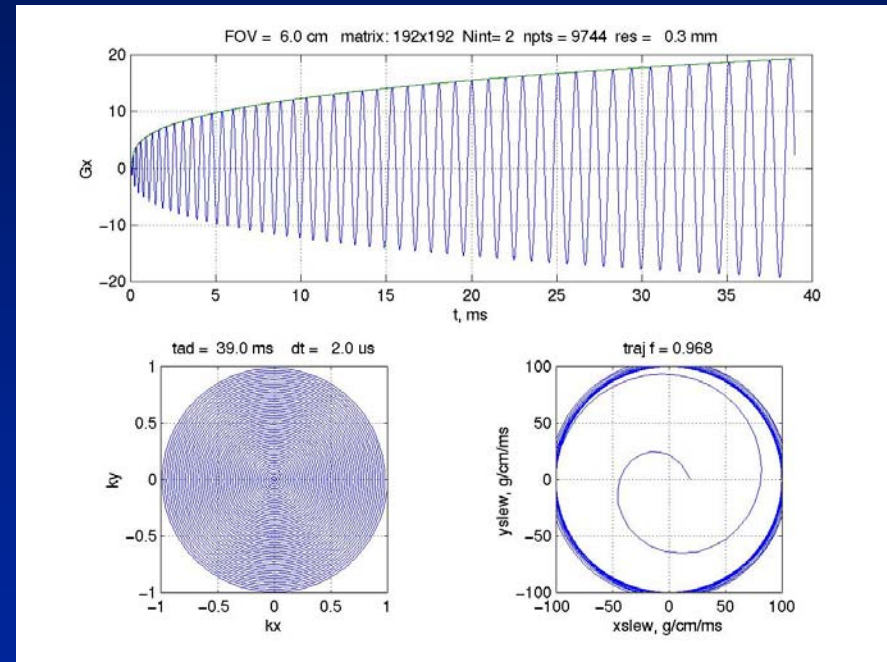


Increased Gradients/Acquisition

- Insert gradient/RF coils (rapid scanning, DWI)



40 mT/m, 150 T/m/s, 8 shots



200 mT/m, 1000 T/m/s, 2 shots

- Multi-channel (e.g. 128) receivers

Hybrid imaging

- **MRI/S and PET (SPECT?)**
PET -> molecular imaging
MRI -> soft tissue contrast, topography (DTI),
vascular kinetics
Bo can increase PET spatial resolution (in one direction)
- **MRI/S and Optical imaging**
Optical -> tissue characterization, static and kinetic
(transmissive and receptive)
MRI -> soft tissue contrast, topography (DTI),
vascular kinetics

Summary

- High field
 - 3T-4T: may become new 'high performance' MRI
 - now primarily neuro; must solve body SAR
 - phased array T/R, RF pulse design, sequence design
 - > 4T: homegrown or partnership with industry
 - facilitate next stages of brain understanding
 - tissue specificity, resolution, resting state noise
 - novel contrast mechanisms
 - breast, musculoskeletal applications
- Continued hardware/sequence evolution
 - must solve large number of issues, e.g. noise, RF effects
- Hybrid imaging- synergistic combination w/ molecular imaging